

TURBINE SPEC Comments

Aaron Nissen
11/20/00

Turbine Scope of Work
3.0 (Comments)

IP Turbine overall to include

Changeout of the 8th Stage w/ rebuilt spare
responsible for rebuilding 8th Stage?

Installation of IP retractable packing

5.0 Design Conditions

Capacity MwG —

(I think it is prudent to ~~define~~ limit capacity to
HP Wheel Power calc versus ~~fixed~~ total generation.
there are too many outside influences on the cycle determining
total generation from cycle. With Capacity incentives and
penalties, I doubt if we could everyone to agree on corrections. So ...)

$$MW_{HPTws} = \frac{\text{flow}_{\text{throttle}}^{HP} (\Delta h_{\text{inlet to exit}}) + \text{flow}_{\text{throttle less HP}} (\Delta h_{\text{exit to exit}})}{3412.1 \text{ Btu/kwhr}}$$

16.0 Performance Guarantees

I guess I don't understand why we aren't shooting for 92.0%
(sounds as though they are achieving 93-94%)

Test Tolerances of 0.25% - why applying test tolerances at all?

9.0 Reference Drawings

Do not include GE provided Heat Balance Diagrams

(GE claims they are proprietary)
Anyway these are ~~not~~ the ones we want, you included Design.
Dave is printing up (should have done this week)

U1+U2 Acceptance Heat Balance Diagrams

U1+U2 Current Heat Balance Diagrams

15.0 Perf Testing

Measurement Uncertainty

Temperature ASME PTC 6 calls 1°F (0.1%) @ throttle

add → Flow 0.5% might be a little tight (0.05%)
0.15% final feedwater flow

two parallel points → multiple locations

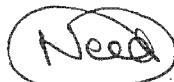
for instance - throttle inlet 4 leads coming in for 4 measurement points
(versus 2 or just 2)
if only one line, we would have redundant measurements

repeatability - minimum of 2 tests that agree within .25, average results

Warranty Inspection? ~~after~~ up to 2 years if they don't meet acceptance

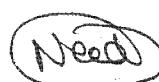
Need to stipulate where Extraction Point is

must meet heating requirements of FW heater allows addition of MW + M



Steam Seal Clearance Diagrams

Required for perf testing, steam path audits + rebuilds
balance piston - steam flow requirements



HP Turbine Repair+Rebuild Spec Sheets

Required blade design info to reestablish bucket and diaphragm profiles on future rebuilds

need throat openings (airgap)

bucket + diaphragm partition profiles @ X4+T or profile gauges
radial heights

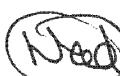
trailing edge thickness

(or we need time to sitdown and reverse engineer when
the HP turbine comes in opened up)



Complete list of all Turbine replacements and contact person

{ we need to be able to contact all installations good + bad }



Required list of Special Tools



List of Spec Parts



HP Design - Heat Balance

where extract point is + design conditions

Vibration - Balance Specs

- Are we going to provide HP turbine ~~rotor~~ balance
Spec criteria

G1 ISO 1940

Supplier must provide HP turbine balance provisions
for turbine end, generator end & mid span and
inner & outer shell ~~feet~~ ^{slot} access ports must match.

TURBINE DESIGN

2400 psia Throttle press (

1000 F Throttle temp

6750 Throttle flow (Kpph)

92% HP ~~Eff~~ Enthalpy Drop

297.6 HP Wheel Power (mw)

Valve control - sequential valve operation (partial arc)

TESTING - 3rd Party independent

bring in own test equipment independent
temps

pressure independent

flow inlet / exhausts

final feedwater

outage inspection

HP Htr & ext (2)

methods - heat balance

or on site

enthalpy drop tests

Establish flow carries 1st stage press
Testing @ 25/50/75/100 (fuller)
VWO/ 1st 2nd + 3rd crack point

Test cabinets for press / head (outage blowdown required)
Power measurement
Heat balance across top turbines (Alternative Test +)

IP7011207